A pedagogical experience: the history of medicine at the Universitat Pompeu Fabra*

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Abstract

The history of medicine as a compulsory subject is fully incorporated in medical studies at UPF. In this article its main characteristics are exposed, as well as the objectives that are pursued. Some historical examples (Vesalius, Leibniz, Ramón y Cajal) are discussed to illustrate the interaction between diverse areas of knowledge in the definition and generation of medical knowledge.

Keywords: culture, historic development, medicine, society.

Introdution

One of the features of the present medical studies is the increased use of technology in medicine. The direct consequence of this is the biological approach that defines a curriculum which is utterly biological. Of course, nobody will deny the fact that future

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physicians will, while exercising their profession, be dealing with living organisms who, at the same time, are social beings in particular cultural and social surroundings.[1]

In answer to this, the need has been recognized many years ago that future physicians should be given an education which not only encompasses the biological and clinical aspects but also the social and human ones which make up what we consider the disease and the strategies of therapy.

As far as the historic development is concerned, medicine is certainly the most complex of the scientific disciplines. It is the product of the interaction of different spheres of knowledge and occupations which in the course of time gave rise to different concepts of scientific development, of health, and of disease. From an epistemological point of view, it is absolutely necessary to understand that medicine includes scientific, practical, social and cultural aspects in order to fully grasp what is disease, its cure and the very practice of medicine. The contribution of the history of medicine should be, among others, to further among the students of medicine the development of scientific and humanistic thinking during their studies and later in their professional career. Thinking about history will allow the future physicians to understand knowledge as being both a cultural and a historically built product and they will be aware of the fact that there are different ways to read reality and there are different forms of change.

History of medicine at the Universitat Pompeu Fabra

I would like to present in a few words the contents and the goals of the introductory course to the history of medicine which is given at the Faculty of Medicine and Life Sciences of my university, the Universitat Pompeu Fabra.

[1] Putsch RW III, Joyce M. Dealing with patients from other cultures. In: Walker HK, Hall WD, Hurst JW, editors. Clinical methods: the history, physical, and laboratory examinations. 3rd ed. Boston: Butterworths; 1990. p. 1050.

This is a compulsory course which is taught during the first year's first term. This means that the students come directly from secondary school and this is their first contact with university. The credits given for this course is the same as that for any other subject –be it physics, anatomy, chemistry etc. That is to say, that from the institutional point of view and the goals pursued by our faculty, the recognition and the requirements for this course are the same as those for any other course which may be more closely "identified" with the studies of medicine. On the other hand, the goals of this course are both shared and supported by all faculty members. This is a point which I would like to underline as it expresses the positive consideration of the training environment, both for the colleagues as for the institution, regarding the history of medicine.

I mentioned already that the students who take part in this course arrive directly from secondary school. This creates a special situation and I would like to choose for our subject here only one point, and this is the positive concept of medicine and medical practise. Although quite often the interest of students goes beyond the medical disciplines they are studying, e.g. they have interest in history and philosophy, literature and art, politics and culture, their appreciation of medicine corresponds to a positivist one influenced by the image that is given from society. This positivist interpretation of medicine by the students is an element which we cannot ignore and which we always have to bear in mind if we want that their reflexion about history becomes part of their understanding what medicine is about – not only as far as knowledge is concerned but in practise as well. The teacher's educational strategy must take into account this reality.

During the course, participation and discussion in the workgroups and seminars are encouraged. Apart from that, one of the main objectives is to train the students to produce a paper of historical nature which is tutored by the person responsible for the course.

The course subscribes to a concept of history which is close to the social history of medicine as exemplified by Roy Porter. The introduction to the

course is based one of Porter's books *The greatest benefit to mankind. A medical history of humanity* (W. W. Norton & Company, 1997).[2]

Society, culture and medicine

Since 9/11/2001 I have begun the first lecture of my course with a slide showing the attacks on the Twin Towers in New York.

Although all the students know the facts, many of them do not remember this historic moment, as they probably were no more than one or two years old when this happened. Unfortunately the young people who will begin their studies this year are old enough to have witnessed terror and outrage closer to their home. Sadly enough, Barcelona has joined this list. We only have to think of the 17th of August 2017 at Barcelona.

How on earth, you might ask yourselves, can one begin a course on the history of medicine referring explicitly to 9/11?

You may remember that when the systems of security and the prevention of terrorism were discussed, there began, or rather there was resumed, the debate about the theories of Samuel P. Huntington and his *Clash of civilizations*. Huntington assumed that people›s cultural and religious identities were the primary source of conflict.

Very soon after the attack which was considered as an aggression on Western culture and values, there were many who joined the discussion and who wanted to reaffirm Western values as opposed to what they considered religious radicalism of the most intolerant kind.

Umberto Eco joined this discussion with a lot of good judgement and common sense. He tried to establish the parameters which would allow to compare these cultures, which, according to Huntington, were in conflict and which by their struggle supposedly defined the course of

[2] Although it may be outdated in many respects, still of great use is Laín P, editor. Historia universal de la medicina. Barcelona: Salvat; 1975.

history. In one article which was published in the Spanish newspaper *El País*, Eco stated:

«(…) If we assume that life extension as such is a value, then of course medicine and Western sciences are certainly superior to the medical knowledge and practices of many others (...)."[3]

Regardless of whether we accept this statement or not –it is here that Western medicine appears, that is, the medicine whose history we study as a body of scientific knowledge, which is identified with a model of society, of very concrete values and historical developments. What can be seen more clearly, if possible, is that medicine appears (and that is my point) as a *tertium comparationis* to establish categories and valuations between diverse cultures and traditions which shape our multicultural societies.

Barcelona is an utterly multicultural city. In its boundaries more than 166 nationalities and more than 20 religions live together. That means that our students are trained as physicians in a society where certainly the idea of what is medicine, and all the elements which can be associated with it (health, our body itself, the consideration of intimacy, etc.) can be understood very differently, maybe even in opposing ways. To show this reality in the most direct way, to help to understand the surroundings in which many of those who are now students will eventually practise their profession, is one of the tasks of our faculty and one of the goals of our course.

Examples to understand the historical development of medicine: Vesalius, Leibniz, Ramón y Cajal

In his autobiography, *This Was my Life*, published in 1951, Ferdinand Sauerbruch, one of the most famous surgeons in the first half of the 20th century, tells, how he met the already old Wilhelm Röntgen, the discoverer of the x-rays which brought about quite a change for medicine. During

[3] Umberto Eco. *Las guerras santas: pasión y razón*. El País, 15/10/2001.

their conversation Sauerbruch had the opportunity to discuss Röntgen's invention. "I was angry and of the opinion", Sauerbruch writes, "that the x-rays were an attempt to relieve us, physicians, of the sublime art of diagnostics and to have to trust a simple photography. A radiograph", Sauerbruch protested, "should confirm the clinical diagnosis of a disease, and not be the starting point. A physician should come to a diagnosis by using his senses, his hands and his brain, not some dead mechanism!"

People who know the history of medicine will recognize in Sauerbruch's words the most valuable lessons which not only hippocratic medicine may teach, but also the empiric medicine which was practised by the ancient Egyptian priests long before Hippocrates. This is the time in history which we traverse during our course: the evolution of medical practice from Antiquity in which we recognize the origin of our tradition of thought, that is from ancient Greece to the medicine of the 20th century.

I have to tell you that our course is more oriented towards the achievement of medicine as a scientific discipline than about the knowledge of how to attend to patients.

I would like to present to you a series of examples which we consider during the course, where we think about the influence of knowledge which is gained beyond the strictly medical knowledge but which has far-reaching consequences when new scientific knowledge is produced and which are even responsible for revolutions in medical knowledge.

Let us have a look at Andreas Vesalius, Gottfried Wilhelm Leibniz and Santiago Ramón y Cajal. And let us take a look from an interdisciplinary point of view, an often recurring subject in the world of higher education.

As far as medicine is concerned I have to say that historically speaking it was extraordinarily difficult for physicians to accept this interdisciplinary approach which is so much praised today: Pasteur who was a chemist by profession could never lecture at a faculty of medicine, as physicians did not recognize him as belonging to their profession. The same happened

to Paul Ehrlich who, although he had studied medicine, positioned himself between medicine, biology and chemistry. It is quite common that these scientists who had an interest in more than one field do not appear in biographical collections showing the great representatives of medicine.[4]

You will probably know that the tensions which marked knowledge from its early beginnings is the tension between theoretical and practical knowledge. Even if this tension is not as acute as it used to be it is apparent in the systems of our higher education, where physics, for example, is not taught the same way at a traditional university, a technical university or a polytechnic university.
A well-known example for this is Albert Einstein's experience as a student at the Federal Polytechnic School at Zurich.

When this differentiation has been overcome, which does not preclude a clash in the valuation of these fields of knowledge, it has often given an extraordinary impulse to producing knowledge. It is in this context that we look at Vesalius.

Many of our students are used to interpret pictures as a source of scientific information. Pictures, like the famous x-rays by Wilhelm Röntgen, the positron emission tomography to identify early sings of Alzheimer's disease revealed by brain scans and the well-known images of the exhibition Körperwelten (Body Worlds), are all pictures which the students know. These are all examples of how knowledge is passed on by using pictures. This process which led us hither and which Sauerbruch criticized in such harsh words, began with Vesalius.

The tradition of mathematics which began at the end of the 15th century and took concrete forms during the 16th century was not the only experimental approach to

[4] For example in Engelhardt, Dietrich und Fritz Hartmann, 1991. Klassiker der Medizin, in 2 Bänden. München: C.H. Beck Verlag, here vol. II.

understanding nature.[5] There were also many important developments in anatomy and physiology. At the university of Padua, for example, a revolutionary change in how anatomy should be taught at medical schools took place in 1537 when the humanist doctor of medicine Andreas Vesalius (1514-1564) who skillfully performed dissections was appointed. While teaching anatomy, Vesalius carried out his own dissections. At that time it was more common to read Galen, the ancient authority, while a surgeon performed the dissection. This way, Vesalius became extremely popular among the students of medicine. And what is even more: his great book *De Humani Corporis Fabrica* published in 1543, was both a text on anatomy and an excellent practical manual on how to proceed when performing dissections.

Vesalius took care to write a preface in which he deplored the separation of surgery (in Vesalius' time a traditional craft) from medicine. As a result of this, Vesalius' anatomy came to be considered, at least by some, as "the basis of all medicine" and threatened to take the central place which philosophy of nature had held in medical education.

Vesalius, supposedly, found 200 errors in Galen's scripts on anatomy. The most important one of them was the discovery that the wall inside the heart which separated the right ventricle from the left one was not perforated which threatened Galen's entire physiology. Although Vesalius did not go much beyond this, his successors in Padua made quite a few revealing discoveries. Renaldus Columbus (1510-1559) proposed the theory of pulmonary circulation (according to which blood moves from the right ventricle of the heart to the left one, going across the lungs before being filtered across the presumed perforations in the muscular wall in between), whereas Hieronymus Fabricius (1533-1619) discovered

[5] We follow here Henry, John. The scientific revolution and the origins of modern science. New York: St. Martin's Press; 1997.

the major valves in the legs which, as William Harvey (1578-1657) later realized, allowed blood only to flow towards the heart.

But what was the essence of the revolution in education which was brought about by Vesalius' work? Simply the action of individuals who overcame the differentiation between intellectual work and manual work in recognizing the epistomological value of knowledge which was produced outside the body of classical medical knowledge but which could contribute in an extraordinary way to the understanding of the human body. And this knowledge which was generated outside the medical body of knowledge was the knowledge of artists, and this individual who was capable of overcoming these differences was Vesalius.

Albrecht Dürer had already affirmed that "the more your work corresponds in its form to life, the better your work appears". That means that one has to have a profound knowledge of the different expressions of life, if one wants to represent them in pictures or sculptures.

It is this need for knowledge which Michelangelo pursued, when he assisted classes of anatomy which were given at many "bottegas" where the necessary knowledge was imparted on the artists. Another well-known example is that of the painter Paolo Veronese who had himself represented with anatomical models who were expressly chosen for studying human anatomy.

It is this very knowledge of the artists which Vesalius should later value in his perspective and recognize its great potential in representing human anatomy, the central knowledge on which the medicine of that time was built. The use of these magnificent engravings for medical classes meant a revolution in education which we all, who use pictures with the intention of imparting knowledge, owe to them. This revolution was not limited to illustrations but extended to three-dimensional representations which can be seen in the museum of La Specola in Florence.

Another example of the influence of knowledge which was produced outside of medicine in the course

of history is the significance of the thinking of Leibniz on the first people to use the microscope in dissections and on how the idea of the cell took shape which has been of fundamental importance for life sciences and medicine since the 19th century.

Considering the contribution of Leibniz's philosophy means to present to the student a tradition of thought, namely German idealism and philosophy of nature, of a highly speculative character which may, as I mentioned already, provoke certain resistance in a student of highly positivist thought.

The solution which offers itself is to point out to the student that Leibniz's contribution was decisive in the course of history which led to the definition of the idea of the cell.

At the time when Newton's mechanics dominated Europe, a philosophy developed in Germany which had quite different features, and sometimes was even opposed to them.

The German philosophy of life and of romanticizing nature was opposed to the concept of mechanics, according to which nature was something simple and homogeneous, as its beings were uniform and mechanical. The philosophers of Romanticism, on the other hand, emphasized the unique and particular character of everyone of the living beings.

A precursor of the philosophy of nature was Johan Baptista Van Helmont (1579-1644), who stated that the entities which make up the world are a multitude of autonomous beings, everyone with an internal force from which it is produced and from which it develops.

This idea was seized on by Gottfried W. Leibniz (1646-1716) who saw the world as being composed by a definite number of units or Monads which were independent centres of vital strength. These monads formed composite substances which in their turn were part of a harmony which had been preestabliished by the one and only Creator.

As opposed to Newton's system, which was composed by inert and equal atoms, Leibniz's monads were active purely spiritual and unique forces. Inside the various levels of

organization, the monads made up the whole universe.

This idea of Leibniz and later that of the philosophers of nature, for whom the diverse types of living organisms were composed of the same material units, turned into the materialization of the idea of "infusorial mucous vesicles" as Lorenz Oken (1779-1851) called them in 1805 and which later became known as cells.

In his prediction of the existence of the monads, Leibniz based himself on the work of the contemporary microscopists which seemed to contradict the mechanical philosophy. As he said, "All of nature is full of life," "microscopes have shown to the eye that there are more than a million live animals in one drop of water." (Leibniz's letter to princess Sophia, 4-11-1696).

There is another reference to the work of the microscopists: "The transformations of Swammerdam, Malpighi and Leeuwenhoeck, outstanding observers of our time, helped me here to accept that the animal and all other organized substance when we think and its apparent production is only a development and some sort of increase" (*The New System of Nature*, 1695, § 6).

"... today through exact investigations which were performed on plants, insects and animals knowledge has been received that the organic bodies of nature are never the result of chaos or rotting but always of seeds, in which there had been undoubtedly some sort of preformation. One came to the judgement that before conception there had not only been in them (i.e. the seeds) the organic body but also a Soul in this body, and in one word the animal itself; and only by way of conception this animal became prepared for a great transformation in order to turn into an animal of another species" (*The Origin of the Souls and of the Animals).*

Being in the tradition of thought of the philosophers of nature and Leibniz's thesis, Lorenz Oken, relied on the experiments of his colleague Dietrich Georg von Kieser these basic units of life, the cells of life and their hypothetical origin. Lorenz Oken

took Leibniz's concept of the monad and put this theoretical concept into a relationship with the results of the experiments and observations by the microscopists of his time and defined these units of life as "infusorial mucous vesicles". These "mucous vesicles" were in essence the material realization of Leibniz's monads. This theory which apparently came into being in the context of the philosophy of nature would eventually define the theory of the cells, and therefore, one of the pillars of life sciences and medicine.

The last example which I wish to show you turns around the figure of Santiago Ramón y Cajal, the only scientist in the history of Spain who was awarded the Nobel prize in Science.

We think that the figure of Cajal allows to analyze his own career and his scientific contributions but also, as he had a high affinity to culture, it allows us to think about what it means to advance science in a country like Spain, which in Cajal's time was without scientific tradition, the scientists civil and political commitment to his country (at the beginning of the 20th century he was key to build the first fabric for scientific practice in Spain) and the necessity of commitment and vocation with one's own personal and professional option.

During the last years, Spain went through a terrible process and especially from the point of view of education. Highly qualified generations have been forced to emigrate, as after having finished their university studies they could not find a position which corresponded to their qualifications. Germany, Britain and the United States are full of highly qualified Spanish academics who seek an opportunity which is denied to them in their own country. And even 100 years later, this is a reality which is not far away from the one which Santiago Ramon y Cajal lived and overcame.

Cajal was born at Petilla de Aragón, a tiny village which was geographically and socially very far away from the centres of culture and science of that period. Encouraged by his father's activity, who was a barber-surgeon, he began to study medicine. His attempts as an artist and in romance were failures. He lived through personal

crises, but nothing block young Cajal's path to the ever more urgent wish to pursue his vocation. He received his education during a time when medicine was defined as a science based on experience and its using laboratories for practice which finally managed to adopt the epistemological resources of the experimental sciences, especially in physics.

To understand this let us look at the progress which had been made before Cajal's emergence. François Xavier Bichat (1771-1802) was first to propose the anatomico-clinical method. The definite pursuance of laboratory medicine began with the French physiologist Claude Bernard (1813-1878). From the first results of the studies concerning the nervous tissue developed the neurological disciplines. New techniques to manipulate the nervous tissue were introduced by Johann Christian Reil (1759-1813), and new tools were used, like the microtome which had been invented by Wilhelm His in 1870, the new microscopes by Zeiss or the technique of microphotography by Franz Koristka.

From then on, the idea of the cell was definitely established. Rudolph Virchow (1821-1902) declared that *"Omnis cellula e cellula",* Purkynje (1787-1869) described in 1837 for the first time the brain cells (Purkinje cells).

In 1858 Joseph von Gerlach proposed the reticular theory suggesting that there was a network of extremely fine ends of cellular extensions. Auguste-Henri Forel (1848-1931) made the first steps in the theory of neural discontinuity and the concept of the neurone, whereby he finally discovered the neurone. And it is here that Camilo Golgi (1843-1926) comes in who developed a method of dyeing with silver nitrate, which meant a revolution in the study of nerve tissues. Golgi suggested the existence of an anastomotic network between the axons, a real axonal network.

"But what can we say about the irrupton of Santiago Ramón y Cajal?" wondered Severo Ochoa apparently having difficulties coming to grips with it: "It is not easy to explain why Spain has always limped behind the other nations when cultivating science, and it is even less easy to explain how on this dry

ground a figure like that of Cajal could arise… Cajal was self-taught –how Cajal could arise in this scientific wasteland which was Spain at his time, is a miracle for me."[6]

In 1883 Cajal moved to Valencia and later, in 1887 to Barcelona where he developed his neuronal theory which was based on the use and development of Golgi's techniques. But also on Darwinist approaches which allowed for a more adequate experimental plan and finally led to the discovery of mechanisms which rule the morphology and the connection processes of the nerve cells, of the grey substance and of the cerebrospinal nerve system.[7]

After these findings which he considered to be essential, he began a frenetic activity of publishing his theories in Spanish. As Spanish was definitely not a language of science he started to publish in French but with little luck and recognition. All these publications, which thanks to their scientific merits are the basis of neuronal theory, were financed by Cajal himself. As he still had not achieved recognition, he decided to present himself at the Congress of the German Anatomical Society held in Berlin in 1889. It is here that the eminent physician Albert Kölliker who recognized the importance of Cajal's work. From then on Kölliker was the first and foremost to make Cajal known and support him. And from this moment Cajal became part of the international scientific elite.

With his international recognition began his commitment to the historic advancement of his country. He demanded from the Spanish government to define a scientific policy to lead the country out of poverty which he mainly understood

[6] Severo Ochoa. Prólogo. In: Ramón y Cajal. Reglas y consejos sobre investigación científica. Los tónicos de la voluntad. (Libro consagrado a la juventud española). Madrid: Espasa-Calpe; 1995. p. 9-10.

[7] The respect which Santiago Ramón y Cajal commands allows to visit as a group the house where Cajal lived during his stay at Barcelona, at a time when he established his neural theory.

as being a poverty of culture and education. In 1902, he obtained from the government the financing of the Laboratory for Biological Research which was eventually named the Cajal Institute, where he remained active until his death.

In his effort to make his country more dynamic and because he understood that he could only achieve that by education and scientific training he pushed through the creation of the Junta de Ampliación de Estudios (JAE, Union for Furthering Studies and Scientific Research) whose president he was until shortly before his death. The JAE sought above all to get closer to the great international centres, sending students and professors there for further training, so they could return afterwards to their own country. The JAE was an institution that adhered to liberal values and the Republic. By conservatives and fascists it was considered as the archenemy that was to be eliminated at all costs, an aspiration which was tragically fulfilled after the defeat of the Republic and the dismantling of the democratic system in 1939. It did not take the Franco regime very long until it had physically and institutionally eliminated all members of JAE and replaced it by the present CSIC (the Spanish National Research Council).

So Cajal is an example for a tenacious and convinced scientist, but he is also a person who created through his work and a person who felt his responsibility towards his fellow-citizens. Tenacity and conviction is what we as educators have to transmit to our students during the long years of their studies. But also a commitment and a sensitivity towards our fellow-citizens, as obvious a demand for our future physicians as for any other citizen.

Results and impression of the students

Good. Do the students appreciate the course on the history of medicine? Surveys at the end of the course show a very wide spectrum regarding the evaluation: from "extraordinarily interesting" to "more medicine and less history". But most evaluations range from "good" to "interesting" and "very interesting."

While considering the perception of the students, it should be noted that

three years ago a numerous group of them filed a petition to the faculty to include reading and comment a novel (on medical subjects) in different courses during the medicine study. We were very surprised, but from the pedagogical point of view, that was an initiative which showed that our effort to present the benefit of Humanities to understanding what medicine is, and most importantly, what it could be, was successful. Since then, not all, but a lot of the courses incorporate the compulsory reading of a novel in this programme.

Probably, as in every field and discipline, the problem or the question is not only to explain the benefits of Humanities (in this case the History of Medicine), but how to stimulate the students' interest in them, and that means, it is also a problem of how to broach the subject to the students, and therefore, a pedagogical question.

Bibliography

- Hays JN. The burdens of disease. Epidemics and human response in western history. New Brunswick, NJ: Rutgers University Press; 1998.
- Laín Entralgo P, editor. Historia universal de la medicina. Barcelona: Salvat; 1972-75.
- Porter R. The greatest benefit to mankind. A medical history of humanity. New York, London: W. W. Norton & Company; 1997.